TWENTY-SEVENTH ANNUAL REPORT

January 1, 1937 to December 31, 1937

Northern Rocky Mountain Forest and Range Experiment Station
Missoula, Montana

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U. S. Department of Agriculture, Forest Service

NORTHERN ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

STEPHEN N. WYCKOFF, DIRECTOR

Missoula, Montana

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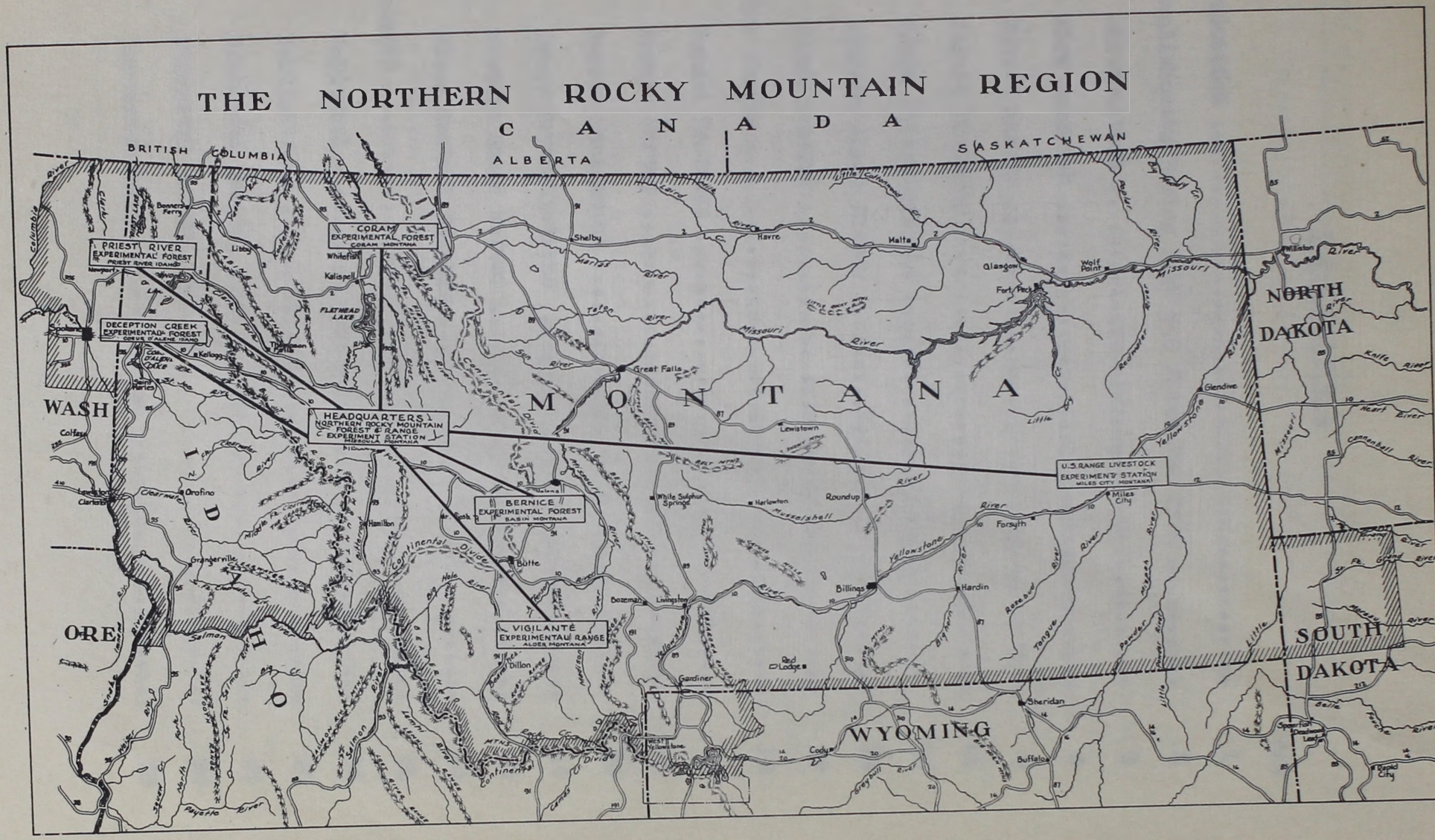
THE NORTHERN ROCKY MOUNTAIN REGION
C A N A D A
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
PRIEST RIVER EXPERIMENTAL FOREST
PRIEST RIVER IDAHO
CORAM EXPERIMENTAL FOREST
CORAM MONTANA
DECEPTION CREEK EXPERIMENTAL FOREST
COEUR D'ALENE IDAHO
HEADQUARTERS
NORTHERN ROCKY MOUNTAIN FOREST & RANGE EXPERIMENT STATION
MISSOULA MONTANA
BERNICE EXPERIMENTAL FOREST
BASIN MONTANA
VIGILANTE EXPERIMENTAL RANGE
ALDER MONTANA
U.S. RANGE LIVESTOCK EXPERIMENT STATION
MILES CITY MONTANA
M O N T A N A
WASH
IDAHO
ORE
WYOMING
NORTH DAKOTA
SOUTH DAKOTA
Shelby
Havre
Malta
Glasgow
Wolf Point
Fort Peck
Williston
Great Falls
Lewistown
Glendive
Kalispell
Whitefish
Libby
Bonners Ferry
Spokane
Kellogg
Coeur d'Alene
St. Maries
Colfax
Lewiston
Clarkston
Orofino
Clearwater
Hamilton
Grangerville
Salmon
Butte
Dillon
Bozeman
Livingston
White Sulphur Springs
Harlowton
Roundup
Miles City
Forsyth
Billings
Hardin
Red Lodge
Gardiner
Cody
Buffalo
Sheridan
Rapid City
Missoula
Flathead Lake
Continental Divide
Yellowstone River
Missouri River
Columbia River
Snake River
Salmon River
Clearwater River
Powder River
Tongue River
Bighorn River
Rosebud River
Little Missouri River
Knife River
Heart River
Cannonball River
Grand River
Moreau River
Belle Fourche River
Little Missouri River
Milk River
Marias River
Teton River
Sun River
Judith River
Musselshell River
Big Hole River
Bitterroot Range
Lemhi Range
Lost River Range
Beaverhead Mts.
Centennial Mts.
Gravelly Range
Madison Range
Gallatin Range
Absaroka Range
Big Belt Mts.
Little Belt Mts.
Little Rocky Mts.
Bighorn Mts.
Wind River Mts.
Grey Bull River
Shoshone River
Yellowstone Nat'l Park
Sperfish Lake
Deadwood Lake

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of the

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INTRODUCTION

Livestock production and timber production are two of the industries upon which much of the development and prosperity of the Northern Rocky Mountain region have been based. The history of the region since the period of pioneer development has been marked by the rapid exploitation of the natural resources which make these industries possible. In too many instances this exploitation has been destructive in nature rather than constructive, in that it has involved the use of the resources without thought for their renewal. The opportunity still exists, if taken promptly, to place the production of timber and of forage upon a permanent basis. To accomplish this, however, will require recognition of the urgency of the need, development of the requisite technical information, wise planning to put this information into effect, and the social and economic adjustments which these measures will inevitably demand. The reaction to these needs will determine the ultimate prosperity of the region.

In North Idaho the great bulk of the virgin white pine resource in private ownership has been exploited. Upon the basis of that exploitation a forest industry has risen, flourished, and now is beginning to decline. Cutting of the virgin forests in some districts has gone forward at such a rate that sustained yield management under the present mill setup is already impossible. The economic and social welfare of many of the forest communities dependent upon these mills is seriously threatened.

In certain parts of western Montana the forest resources are almost untouched. There is presented here an excellent opportunity to plan for the management of this timber resource and for the use of these forest lands as a part of a broad land-use policy.

There are included within the Northern Rocky Mountain region some 65 million acres which have been classified as range lands. The proper management of these range lands presents as many serious obstacles and problems as does that of the forest lands of the region. The plowing for dry farming of some six million acres of excellent range lands in the eastern Montana plains country, together with the several million more acres of unplowed range land the productivity of which has been

seriously depleted by overgrazing, drought, and insect infestation, presents a serious obstacle to the economic future of the livestock industry within the region.

Entirely distinct from the plains portion of the region is the geographic and climatic subregion embracing more than 40 million acres of mountains, foothills, and valleys in North Idaho and eastern Montana where more than three-fourths of the water for irrigation and power for the region originates. The more populous valleys are within this subregion where owners of approximately one and one-half million cattle, sheep, and horses are dependent upon range forage from surrounding foothills and mountains. This dependent population cannot attain stability until factual data are available to replace trial and error methods in the management of these ranges.

Cutting, fire, and grazing all have important effects on stream regimens, local floods, soil erosion, siltation of reservoirs, and irrigation and maintenance of water supplies. The problems of reestablishment of the proper vegetative cover and retardation of erosion and run-off are of far-reaching and immediate importance.

One of the major functions of the Northern Rocky Mountain Forest and Range Experiment Station of the United States Forest Service is to assist in the solution of these regional problems. It is charged with the duty of obtaining factual data which will serve as the basis for wise land-use planning. By virtue of its particular responsibilities, both to the Forest Service and to the region as a whole, it operates primarily in the fields of forest and range research. Within the limits of its finances and facilities it is carrying on a number of projects to obtain specific information in these two fields of knowledge. These projects, together with the prosecution of the forest survey designed to furnish the necessary basic information for the development of forest management plans, have been under way during the past year and for several years before. The urgent need for study in forest influences is recognized but funds have not been available to undertake this work.

Much of the encouraging progress that has been made at this Station during the past five years has been due to the allotments of emergency funds which it has received. The emergency allotments to certain divisions of the Station have, in some cases, more than doubled the regular appropriations. They have meant the difference between the accomplishment of a highly adequate plan of work and the mere maintenance of going projects. The living quarters, the adequate office and laboratory facilities, and the generally improved plant setups at the actively operated experimental forests and ranges are due almost entirely to the use of emergency funds. Although range research and forest survey have received increases in their regular appropriations during the past two years, the divisions of Silvics, Fire, and Forest Products are still operating

upon the reduced allotments of regular appropriations which the Economy Act of 1931 made necessary. For the past three years allocations of emergency funds to all of the divisions have been annually decreasing. This has necessarily meant either that going projects had to be curtailed to the point at which very little active progress could be made or that certain of them had to be temporarily discontinued.

The solution of the problems upon which the Station is working will have a distinct bearing upon the economic development of the region. The need for such solution has been steadily growing. At the same time, the financial resources available to the Station for work upon these problems has been steadily decreasing with the gradual withdrawal of emergency allotments.

ACCOMPLISHMENTS DURING 1937 AND PLANS FOR 1938

SILVICULTURE

Following the policy of attacking the most urgent problems first, major emphasis, since the initiation of silvicultural research at the old Priest River Station in 1910, has been in the western white pine type, and especially on the species western white pine. Attention has been primarily focused on studies of growth, volume and yield, and the problem of natural regeneration. Valuable but less complete information also has been obtained on several other silvicultural problems. Useful research has been performed, notably field planting methods and seed germination. A good start on the necessarily long-time job of developing sound improvement measures has been made.

Encouraging and fruitful as these investigations have been, however, the job is only well begun. Surprisingly little is known of the regeneration and growth of the species associated with western white pine in the type. Utilization of these so-called secondary species is at present the dominant silvicultural and economic problem in the management of the western white pine type. More specialized research is needed. Detailed studies in forest soils and tree physiology are necessary, for example, to obtain a more complete understanding of the factors controlling natural and artificial regeneration. The harmonization and adoption of silvicultural methods with fire, insect and disease protection requirements is a large field offering much promise for useful and concrete accomplishments that has been scarcely touched in this region. Real advance in forest practice necessitates a close integration of the findings of silvicultural, forest utilization, and economic investigations. This Station cannot fulfill its research responsibility in the Northern Rocky Mountain region unless a well-balanced and reasonably comprehensive program of silvicultural research can be financed in all the major types of the region.

The major accomplishment in Silviculture during 1937 was the completion of a 289-page manuscript for a technical bulletin, "Natural Regeneration in the Western White Pine Type." This publication will fill a long-felt need for a general and comprehensive presentation of available information on natural regeneration problems in this type collected during 25 years of research and nearly 30 years of National Forest timber cutting practice.

A four-man field crew gathered information on 98 temporary sample plots in making a study of growth and mortality following logging in the western white pine type. Field work for this study will be completed in 1938 by making a special study of mortality in cutover stands to obtain additional information on this extremely important phase. Field data gathered in 1937 and 1938, together with data from a series of permanent sample plots in cutover stands and from an unpublished cutover area study made by Haig in 1928, will form the basis for a fairly comprehensive report on growth in partially cut stands in the western white pine type. This study will supply an important part of the technical information necessary to intelligently and successfully apply partial cutting methods in the type.

Preparation of this report, together with a companion manuscript on "Natural Reproduction on Cut-over Area in the Western White Pine Type," a case study of natural reproduction on a number of cut-over areas, now nearly completed, will round out a well-balanced set of publications presenting information available to date on western white pine silviculture. To recapitulate, this set of publications will include the general bulletin on natural regeneration just completed, a detailed monograph on factors controlling initial survival (published as Yale bulletin no. 41), a stand improvement manual (mimeographed), a pictorial album of stand improvement practice, yield and volume tables for all important species in the type (published as technical bulletin no. 323), a case study of natural reproduction on cut-over areas, and finally the study of growth of residual stands on cut-over areas.

Completion of these manuscripts is a major objective in Silvics for the immediate future. Limited personnel during the past year has necessarily slowed down the manuscript and investigative program. One member was transferred from the Station in 1937; another is absent on educational leave during the 1937-38 school year, and a part of the time of the man in charge of this division is necessarily occupied with administrative and supervisory work.

Forestation studies have been continued on a limited scale with no new research results of importance to report. By mutual agreement between the Station and the Region One Planting Office, investigative work by the Station was concentrated on a study of direct seeding, while the Planting Office continued class-of-stock

and carefulness-of-planting studies cooperatively started a year ago. New work by the Station was limited to the installation of four latin square plots to investigate direct seeding methods.

Worthwhile progress in an understanding of factors affecting the early development of natural reproduction, knowledge of which is essential in evolving stand improvement methods, was made by a study of actual light intensities under various densities and kinds of overwood stands. Density of the residual stand is one of the major factors affecting the development of natural reproduction beneath. Previously, there was no clear conception of what, for example, a 50 percent crown canopy in terms of light measurement was in terms of number of trees, basal area, or other common measures of stand density.

The Deception Creek Experimental Forest is increasingly demonstrating its value for research and demonstration of timber management problems. The building program possible with present finances is practically completed and the headquarters is now a fairly well-rounded unit, in good working order, and reasonably sufficient for present needs. The Forest had about 250 visitors in 1937 and a larger number is expected in 1938. A descriptive, pocket-sized leaflet describing the Experimental Forest and its objectives has been prepared to supply the frequent requests for general information about the Forest.

Progress has been made on a general overhaul and reorganization of going projects and development of a comprehensive research program for the future. More will be accomplished during the remainder of the winter season.

As to plans for 1938, the first objective, as stated, is to complete the manuscript program. This has been the main objective for some years past and will remain so until the slate is cleared. The three main manuscript jobs are: "Natural Reproduction on Cut-over Areas in the Western White Pine Type," "Growth on Cut-over Areas in the Western White Pine Type,"and "Growth on Larch-Douglas Fir Cut-over Areas in Western Montana."

Other work scheduled for the coming year is (1) maintenance of permanent sample plot records. There is a fairly heavy schedule of plot remeasurements coming up in 1938. (2) Continuance, although on a small scale, of direct seeding studies. The work will include periodic examinations of four latin square plots established in the fall of 1937 and the establishment and observation of four new plots to be established in the spring of 1938 to compare spring with fall seeding. (3) A limited amount of work continuing reproduction development studies. (4) An economic analysis of silvicultural methods applied in the western white pine type.

The division will go into the 1938 field season with a technical organization composed of two regular staff members, two technical men under temporary appointments, and six temporary field assistants.

FIRE RESEARCH

The purpose of forest fire research is to develop methods of measuring forest fire danger and to systematically plan forest fire control upon the basis of this measured danger. It is by such means that the most efficient forest fire control and the least loss from damage can be gotten by all fire control agencies, Federal, State, or private.

Forest fire research was first undertaken by the Northern Rocky Mountain Forest and Range Experiment Station in 1922. The problems were (1) what conditions or factors affecting forest fires needed to be studied and systematically measured; (2) how to measure them; (3) when to measure them--weekly or daily--and at what time of day; (4) where to measure them--in the shade or in the sun, on mountain tops or in the valleys; (5) how to integrate these measured factors into a simple, easily workable method of measuring fire danger; and (6) how to plan fire control on the basis of measured danger.

Since the inception of the research program remarkably successful headway has been made. A fire danger meter which sets up numerical classes of fire danger has been designed. A fire control plan based on factual data anlyzed from thousands of fires and embracing the study of fuel types, seen-area mapping, and transportation planning, designates the manpower necessary to effect control for each of the classes of fire danger which the meter sets up. The result is that the fire protective force in the forests is maintained at the minimum compatible with safety, and striking economies are thereby effected without accompanying increases in fire damage. The results of these studies are available to all protective agencies, public and private, within the region and are much in use.

The work is by no means completed. Numerous parts of the problem are unsolved or only partially solved. Sufficient specific information is not at present available, for instance, to evaluate the effect of the inflammability of such forest undergrowth as shrubs, weeds, and grass at any given time of the season on the rate of spread of forest fires. Only the most preliminary steps have as yet been possible to study and analyze the various types of forest fuels for combustibility, and to locate these types within the forest area by careful surveys. Several other partially solved problems of equal importance could be cited.

Progress was made in 1937 (1) in the installation and operation of several new inflammability stations throughout Region One; (2) in the substitution of 230 Stewart anemometers, purchased by the Forests and costing only $4.75 each, for the former less accurate Northern Rocky Mountain wind gages; (3) in results from the Altitude and Aspect, and the chemical phase of the Vegetation studies which now permit publication on these two basic phases; (4) in the final equipment of the 150-foot steel tower with the necessary

recording instruments to study the micro-meteorology from ground level up through a forest canopy and for 70 feet above it; and (5) in the preparation for publication of "Hornby's Principles of Fire Control Planning," a short article recognized for the last two years as urgently needed in order to simplify and clarify the more detailed explanation given in Hornby's "Fire Control Planning in the Northern Rocky Mountain Region."

The development of the Stewart anemometer is another case of research at one Station benefiting many agencies in many parts of the country. Previous to the investigation of low-cost wind gages, by our Station, the lowest cost anemometer suitable for fire-weather work was priced at about $80. The demand for the $3 Northern Rocky Mountain wind gage, a relatively crude device, stimulated one other Experiment Station and several instrument manufacturers to attempt further development. Three instruments, each costing less than $15 were thereby produced, and the Stewart anemometer at $4.75 was found suitable and sufficiently accurate for our work. The net saving on 230 instruments purchased in Region One amounted to more than $17,000. In addition, this instrument was made available to all forest protective agencies at a similar saving.

The widespread use of previous results of our fire research became increasingly evident during 1937 with (1) the report of the Washington Fire Planning Conference of November 1936 recommending country-wide application of the principles of fire control planning and fire danger measurement originated by this Station; (2) the publication in early 1937 of the request by the Chief of the Division of National Forests for "the production of a tested and reliable danger meter system for each region," (3) the specification in February 1937 that "danger meter planning is the most acceptable form of (determining) presuppression needs" of FF funds; and (4) the application of our Region One danger ratings by the Diamond Match Company which was disclosed by the Spokane General Manager of the Company who, in requesting a rating for the 1937 season in January 1938, informed the Station that the President of the Company in his annual reports to the stockholders for both 1935 and 1936 had quoted our ratings as indices of the character of these two fire seasons.

Plans for 1938 call for a bare continuation of the work, as curtailed in 1937, unless increased appropriations are obtained. If additional funds are available all phases of the Vegetative study will be reinstated, to continue especially the burning tests and the field test of the Vegetative Index dropped in 1937, and to initiate in cooperation with the Regional Office, a study of rate of spread of fire on a large scale in several fuel types on each of several classes of day. Such studies are basic to several phases of our present work and to two new projects which the Regional Office is urging the Station to undertake. They are now rated as of top priority in our program for expansion and the Station will lose much of the leadership it has shown to date, in the field of fire research, unless these studies are commenced soon.

FOREST SURVEY

Field work on the Forest Survey of the Northern Rocky Mountain region was started in 1932. The inventory of the forest lands and forest resources has been completed in the northeastern Washington and the North Idaho units. Field work on the inventory phase has also been completed for half of the 12½ million acres of forest land in western Montana, but the office work of compiling type and volume data is not yet underway. No survey work at all has been done in eastern Montana. Detailed forest type maps are available for all of the country mapped to date. Information is also being collected on the depletion, growth, and requirements phases of the Survey. County reports giving the results of the forest resource inventory are being released as rapidly as the data become available.

The need for the basic information which the Forest Survey project will supply when completed is being realized to an ever increasing extent. The development of intelligent plans for the management of our timber resources and for the use of our forest lands as part of a broad land-use policy is being seriously delayed for lack of such basic information. Due to limited funds and personnel, progress on the Forest Survey within this region has been slow and the final date of completion is still years ahead.

One of the major accomplishments of the Forest Survey Division during the past year was the release in printed form of the basic inventory data for the three northeastern Washington and four of the ten North Idaho counties. Some 720 copies of these reports were issued and additional requests are being received almost every week. Now that all of the original field work on the inventory phase of the Survey has been completed for the northeastern Washington and North Idaho units and the type and volume compilations have been done for all except Idaho County, Idaho, within these units, the Division is better able to fill the increasing number of requests for special data that are coming in. Seventy mandays alone were spent during the past year on the compilation of type and volume data for the Spokane and Snake River watersheds for flood control reports. Two-inch-to-the-mile township plat type maps, and one-inch-to-the-mile unit (40 townships) type maps are available for all of the area covered to date, and many requests for these maps are being filled. Other accomplishments on the inventory phase of the Survey during the past year include the adjustment of all private and State cruises in the commercially valuable timber stands of western Montana, the inventory and mapping of 3-1/4 million additional acres within the same unit, and the type and volume compilations on 4,156,000 and 4,698,000 acres, respectively, in the North Idaho unit. Some work was also done on keeping the inventory data up to date in North Idaho by arranging with forest agencies and private operators for an annual report on the location and acreage of the areas logged or burned and the volume by species that was cut or destroyed. The inventory phase of the Survey for the region as a whole is now 44 percent complete.

Certain sections of the cutting depletion report covering the Northern Rocky Mountain region were recompiled to conform to census restrictions and the bulletin finally released. This report completely covers the average annual cutting depletion of the green timber resources of the entire region, separately by species and forest products for each individual county unit. Data on fire damage and loss were collected on some two million acres mapped last year in western Montana. Due to limited personnel no further work was done during the past year on any of the other causes of forest depletion.

Probably the most outstanding accomplishment of the past year was the determination of a proper growth correction factor to be used in applying normal yield table values to understocked stands in the ponderosa pine type of northeastern Washington and North Idaho. Because the growth rate in such stands was found to be so much greater than that generally applied in the past, a brief description of the field and office technique used in making the study is given. Stocking correlation studies in the ponderosa pine type of North Idaho completed early in the field season of 1937 showed the stocking classes of well, medium, and poor set up for the Forest Survey to have, when compared with normal yield table values, an average stocking percent of only 38, 27, and 15, respectively. This indicates that the average area is less than half stocked in terms of normal yield table values. The presence of scattered trees, small openings, and patches of insect- or fire-killed trees which cause understocking naturally provide greater growing space for individual trees with a resultant increased growth rate. It is evident therefore that growth prediction methods which ignore this accelerated growth will result in serious underestimates. Consequently, to determine the relative rate of growth between fully stocked and understocked stands, a field study was made in the ponderosa pine type by James Girard of the Washington Office and L. J. Cummings of this Station. One hundred and twelve 1/5-acre sample plots were established. The present volume and the volume 20 years ago were accurately determined for each sample plot. The difference between the two volumes showed the growth that had actually taken place during the 20-year period for the trees that had lived. This volume 20 years ago was then corrected for mortality. Mortality for the 20-year period was carefully determined. This mortality volume was then added to the volume of 20 years ago, giving the total volume as of that date. This corrected volume 20 years ago subtracted from the present volume showed the actual growth that had taken place during the period. This was then compared with reduced normal yield table growth. The reduced normal yield table growth divided into the actual growth gave the proper growth correction factor. For example, if the normal yield table estimate of growth for all areas of a certain degree of stocking is 80 board feet per acre and the actual growth determined from measurements for an area of like stocking is 180 board feet per acre, the yield table correction factor is 180 ÷ 80 = 2.25. Due to the fact that this procedure departs radically from the standard practice of applying normal yield tables to understocked stands, a reduction of 25 percent as a safety factor was applied to the original correction factors determined (i.e., the part of the factor over 100). For

example, the original correction factor determined for the North Idaho ponderosa pine type was 2.25. Thus, .75 x 1.25 = .94 rounding off to .90 and adding 1.00 the final correction factor to be used is 1.90. Similar computations result in a correction factor of 1.70 for northeastern Washington. The above correction factors of 1.90 for the ponderosa pine type of North Idaho and 1.70 for northeastern Washington have been endorsed for Forest Survey growth predictions. A like study for the western white pine type has also been made but the analysis of the field data has not yet been completed.

A study of growth rates in western red cedar poles initiated during the middle of the past field season is half completed. One important result of the study was the development of form class taper curves which show merchantable pole lengths by diameter and Girard form class. By use of the graph developed, inexperienced cruisers were able to consistently estimate cedar poles with a high degree of accuracy.

Little progress was made on the requirements phase of the Survey during the past year. Some checking of conversion factors for urban building construction, and further analysis of farm building requirements was done.

Plans for 1938 depend to a great extent upon F.Y. 1939 appropriations. Last fiscal year's funds were so budgeted that the relatively large temporary organization available on July 1 could be kept on intact through the field season. This meant that only a small nucleus of the key men in the organization could be financed through the remainder of the fiscal year. Due to lack of funds field work prior to July 1, 1938 will be out of the question. With an allotment of funds, both regular and emergency, for F.Y. 1939 equal in amount to that received during the past fiscal year, together with what can be done with the present organization and funds for the first half of 1938, the Division plans to accomplish during 1938 the following: (1) Continue type and volume compilations for the area covered to date. (2) Prepare and publish basic statistical data for the six remaining North Idaho counties, the northeastern Washington and North Idaho units, and the four counties in western Montana. (3) Map and inventory 3 to 4 million acres in western Montana. (4) Continue the collection of fire damage and loss data in western Montana. (5) Obtain white pine blister rust losses. (6) Determine the relative rate of growth between fully stocked and understocked stands in the western white pine type. (7) Complete the field work on the cedar pole increment study. (8) Prepare a progress report covering methods of procedure and current growth statistics for the northeastern Washington unit. (9) Depending on size of crew available make normal yield table application studies for the ponderosa pine and larch-Douglas fir types in western Montana. (10) Recheck and apply to urban construction the conversion factors computed. (11) Compute the total lumber requirements for both urban and rural building construction within the region. (12) Collection of additional data on the amounts of forest products used in public and private enterprises.

FOREST PRODUCTS

The principal timbered areas of the Northern Rocky Mountain region, western Montana and northern Idaho, furnish employment for 15,000 wage earners. This means that 60,000 people, or about 40 percent of the population of this area, are directly dependent upon the lumber and timber products industry for their livelihood. Many of these 60,000 people live in small communities where the entire cash payroll is supplied by the Forest industries. Intelligent forest utilization is necessary for the perpetuation and permanent welfare of these communities.

Forest products research can and has contributed much to the economic life and stability of these communities. Uses have been found for species having a very limited market demand. A case in point is the use of hemlock for ties. In 1910 a test track was installed cooperatively with the Northern Pacific Railway using local western hemlock treated ties. The 1937 examinations indicated that only 40 percent of the ties were renewed or replaced during the first 27 years of the test. These ties had an average life of 23½ years which is ample support for the conclusion that this species will give a service life when treated of more than 25 years. Contracts for hemlock ties, which furnished payrolls supporting 100 wage earners and dependents, were awarded two large Inland Empire operators during 1937 on the basis of these tests.

As an aid to timber operators who must constantly seek ways to reduce operating costs the Station has made a study of the requirements of a power saw that will meet local loggers' needs for felling and bucking saw timber. This saw must conform to the following specifications: (1) weight 85 to 90 pounds, usable on sidehills up to 60 percent slope at minimum temperature 20° below zero; (2) two-way cutting saw that can cut horizontally and vertically; (3) motor 5 to 9 H.P. depending upon efficiency of power delivery and size of saw; (4) motor lubricating and fuel systems must have positive action with motor tilted at 45° angle; (5) extra rugged construction equipped with 24- and 36-inch saw capable of 4 hours' continuous use without filing; (6) quick and positive acting clutch; and (7) selling price not more than $400.

Not only must the lumberman meet the need for lower production costs but future supplies of timber and their character must be considered. With this in mind studies of the utilization of Idaho white pine for matches have indicated that approximately 100 million feet of 2- and 3-inch plank are used annually for this purpose, practically all of which comes from mature or old-growth timber. From 50 to 75 percent of the lumber cut from old-growth white pine is suitable for matches while second-growth (65 years old) timber yields only 40 percent match plank. After the old-growth white pine is exhausted the only raw material supply for the match industry will be second-growth timber. When that time comes, and it is fast approaching, match manufacturers must plan for a substantial increase in the annual cut of white pine lumber in order to meet their match plank requirement or turn to substitute species.

Results of a study made during 1937 of branch and knot development in western white pine showed that branches live about 25 years. It then takes about 80 years, sometimes less and often more, depending upon environment before the dead stubs fall from the tree and become covered with clear wood. Whether pruning can be justified in young white pine stands is worthy of additional consideration and study.

The maintenance of the current statistical work and the supplying to the public of technical information is no small part of the Division's work. Up-to-date statistics on the amounts of forest products produced, the cost of their production, and the sale value are needed in the analysis and solution of almost every forest problem. Detailed costs of lumber manufacture have been collected by the Division since 1916, and the selling value of lumber products by species, grades, and sizes for the region has been compiled since 1913. Statistics of this sort, available over a long period of years, become increasingly valuable from a historical and trend standpoint.

There are yet many utilization problems in the Northern Rocky Mountain region that must be solved. In northern Idaho none of the white pine operators are organized to supply their present timber requirements from their own lands indefinitely. Nearly every year sees one of the large sawmills go out of production. None of them can see more than 25 or 30 years of operation ahead. Then will come a painful period of readjustment for some 10,000 wage earners and 30,000 dependents. Case studies of the most important operators are needed to determine (1) economic factors limiting permanent operation and social consequence of liquidation cutting practice, and (2) improvements in existing methods of harvesting and utilizing their timber to assist in stabilizing and perpetuating the forest products industries in as many North Idaho communities as possible.

In western Montana timber supplies are still adequate to maintain existing community forest industry payrolls indefinitely if additional studies can add to the available knowledge. The Bitterroot valley contains a number of small communities where economic studies can determine the facts basic to balancing forest utilization and operating methods with the needs of the community. More and more timber is being trucked away from these small communities to remote larger manufacturing concerns. What are the social and economic effects of such a practice on the local community? As high as 15 million feet of logs per year have been trucked from Hamilton in the Bitterroot valley to points 60 miles away for manufacture, costing the logger $21,000 per year to haul the excess water these green logs contain over dry lumber. What are the possibilities of utilizing this material in a sawmill and wood-using plant where the trees are grown? These problems can best be answered by the application of existing forest utilization data in a manner unprejudiced by local political influences and existing financial relationships.

General plans for 1938 will include the inauguration of two new studies in the timber harvesting and conversion series of investigations. One in cooperation with the Division of Silvics will be designed to apply accumulated results of white pine selective logging studies to an individual logging chance or economic unit. The second will apply the accumulated results of ponderosa pine logging and milling studies to a specific operating unit or community to determine the optimum cutting and operating methods which will produce the greatest permanent contribution to community welfare. A report giving the present status of all the service tests in Region One, together with results to date on tie and fence post tests, will be prepared. The Division will continue to collect and compile the forest statistics as in the past.

RANGE INVESTIGATIONS

Intensification of research and foundation buildings, rather than new developments, has characterized the past year's work in the Range Division. No entirely satisfactory and objective method for measuring height, density, or quantity has ever been devised for range vegetation, particularly that of the short-grass type. This, coupled with the fact that 30 or more acres may be required for each animal and at least 10 animals and three or four replications are needed for an adequate experimental setup, gives rise to a perplexing problem of adequate range sampling and suitable technique at a reasonable cost. Some progress has been made through laborious and tedious trials in the search for better ecological methods and designs for short-grass ranges that will satisfy present experimental standards without excessive cost but no very satisfactory solution is yet in sight after two seasons of effort. Major emphasis in the form of funds and ingenuity of highly qualified ecological technicians is needed to remedy this basic difficulty which now retards progress in range research. Further testing of the paired plot design and various methods for measuring or estimating under yield and density different treatments will be carried out as outlined later in greater detail.

Over much of eastern Montana, severe drought almost equal to the preceding year characterized the early part of 1937. Quadrat chartings completed early in June show total vegetation on experimental pastures to be at its lowest ebb--down to about 10 percent of the 1933 level in density. The reduction has no consistent relationship to the three intensities of grazing followed during five seasons. Better moisture conditions prevailed during the last part of the year and limited recharting work showed some increase in density, mainly due to enlarged size of established clumps. Most new seedlings, however, succumbed to the early drought. Western wheatgrass was able to make good use of October moisture but very few grama or buffalo grass seedlings were established in the Miles City vicinity last year. Generally, but slight progress in range receovery was made in 1937.

Extensive restocking of these ranges swept nearly clean of both livestock and forage by drought during recent years is being proposed. Such action appears at this time to be a wild gamble from a business as well as a land-use viewpoint. Recovery may be somewhat accelerated by more moisture but under existing conditions it hardly seems likely that one or two favorable seasons will rebuild these ranges as fast as some of the more optimistic livestock operators and credit agencies hope for. The danger of restocking faster than range recovery takes place is fully recognized by only a few. A very large acreage of unplowed but drought depleted range may have to be artificially reseeded for recovery in any reasonable time.

State officials and others have already raised the question as to what methods for reseeding these unplowed but depleted ranges will best meet the needs. It has been suggested that the State might well take some action to finance and encourage range reseeding on its grant lands, if possibilities for hastening recovery at a reasonable cost were promising for drought stricken forage. The Soil Conservation Service reports that certain counties have agreed to purchase seed for use on some tax-reverted lands. The Soil Conservation Service is accordingly interested in best available methods. Results from scattered tests already made offer some encouragement that cheap methods partially developed for abandoned croplands may be adapted to these unplowed but depleted plains ranges. More intensive research on this phase of the problem has been initiated at Miles City to meet this call for information in our field. A partial survey on five National Forests indicates that there is in the aggregate a large acreage there in need of reseeding where methods similar to those needed for plains ranges may be usable. Some special equipment will, no doubt, be required for rough, brushy, unplowed ranges. The $5,000 allotment of State WPA funds for used prior to July 1937 largely for locating, fencing, and reseeding tests on these depleted but unplowed Federal ranges.

It is well known that legumes in forage mixtures are beneficial in livestock nutrition and that soil welfare is promoted by their growth. There is considerable evidence to also indicate that forage production is increased by having a legume in the mixture. The seed of various native legumes have been collected and best methods for propagating them, and introduced species, are being tried with a view to using them more extensively in testing a variety of mixtures under different methods. This work could be facilitated by the development of a forage nursery near Missoula. Unfortunately, the delay in completion of the greenhouse and laboratories in the new Federal Building Annex has prevented the detailed soils and greenhouse tests planned for the past winter and spring, but facilities for such work should be ready for next winter.

Experimental work at Vigilante the past year was confined to clipping of plots as a contribution to the Service-wide range utilization study and to numerous reseeding tests with special reference to a peculiar soil condition found there. Limited ERA labor was used to improve two springs, to construct a substantial set of corrals, and to get material ready for completion of the

pasture division fences as soon as funds are available and the design completed for the proposed Season of Use study. It seems inadvisable to hamper work on short-grass ranges by using funds needed there in an effort to start a formal new project at Vigilante without an increase. Present prospects for emergency labor are not very bright, but it is the plan to again station a member of the staff at Vigilante for certain studies on protected and grazed ranges, to follow through on reseeding installations and to supervise such improvement work as can be financed. The increase required to place work on summer ranges on a productive basis is justified in a later section of this report.

Certain valuable information on cheatgrass range for horses with slight expenditures of Station resources was obtained through a simple study on leased winter horse range in cooperation with the Region. Results of this work indicate that cheatgrass had in 1937 a relatively high grazing capacity (1.7 acres per horse month) and a higher feeding value during the cured stage than it has been credited with. This serves to raise further question about cheatgrass eradication work that has been advocated. It also indicates that control measures in which something more enduring is used to replace cheatgrass is a far more promising program than is eradication.

One range development of the past year was the report and approval in the Supervisor's and Regional Offices on the Cliff Lake Bench area on the Beaverhead National Forest near the northwest corner of Yellowstone Park as a scientific area. This area embraces a total of approximately 4,800 acres, most of which is practically virgin grassland unused largely because of its lack of water and the steep slopes leading to the flat-topped bench. The sagebrush and lodgepole timber types are also represented so that the area is of exceptional interest from a botanical viewpoint as a natural area.

The problem of getting better distribution of sheep on experimental pastures and development of practical methods for measuring utilization will require much studied effort on both cattle and sheep range at Miles City during 1938. Comparatively little detailed management work can be accomplished at Vigilante under present limitations. The work plan for the artificial reseeding project is being revised to initiate a more fundamental attack upon the problem.

The range lands in this region comprise approximately 65,000,000 acres, or 60 percent of the total land area in all forms of Federal, State, county, and private ownership. These range resources occupy a key position in any general agricultural adjustment and conservation program in the West. A detailed inventory of the location, extent, value, and present condition of the grazing resources is necessary to determine those management and betterment practices which are essential for the proper development, conservation, and use of the range lands and for the social and economic welfare of the region.

Range surveys have now covered approximately 35,000,000 acres, or 54 percent of all range lands in this region. More than 26,000,000 acres of these range surveys have been conducted during the past two years, mainly under the AAA program or by the Farm Security Administration on grazing lands situated entirely outside of National Forest boundaries. Approximately 94 percent of these recent surveys have covered privately-owned range lands. The current program is organized to complete the drafting of grazing survey type maps and range improvement practice overlay maps on 4,705,000 acres and also tabulate the grazing capacity by sections on 6,395,000 acres of range land situated in six eastern Montana counties. These uniform maps and tabulations will be presented in a written report for each county. This report will provide a brief background picture of the physiography, soils, climate, major land uses, range conditions, and social and economic conditions, and also give a summary of the grazing resources in each county, proper instructions for interpretation and use of map and tabulation forms, outline improved management practices and describe the major range improvement problems and recommended remedial measures.

Judging by the present use of WRS material and the numerous requests from many individuals, organizations, and agencies for this information, it is evident that the uniform maps and tabulations, together with the written WRS report, will be used extensively by livestock operators, state grazing associations, and land-use planning agencies in the administration of individual operating units, grazing association, and public-owned range lands. In this manner the work of the Cooperative Western Range Survey will be an important factor in securing the proper application of a set of land management practices that will reasonably insure the restoration and future maintenance of the soil and range resources of these six eastern Montana counties at their most productive level. In view of the demonstrated value of this work and the economic importance of the range and livestock industry in the West, an effort should be made to secure personnel and funds from cooperating agencies, or some other source, to continue the project until uniform maps and tabulations and a written WRS report are prepared for each of the remaining 64 counties within this region.

FLOOD CONTROL

This Station has as yet no Division of Forest Influences. Practically none of the long needed research has been done in this field. Among the more important necessary studies are the erosion-streamflow studies in the white pine and mixed conifer types in western Montana and northern Idaho. Cutting, fire, and overgrazing all have important effects on stream regimens, local floods, and especially on erosion, siltation of reservoirs, and maintenance of irrigation water supplies. Supplemental erosion-streamflow research in the spring-fall foothill ranges of central and eastern Montana and in the short-grass ranges of the Northern Great Plains is needed. The problems of reestablishment of range cover and retardation of erosion and runoff thereby are also of far-reaching and immediate importance. Questions on these subjects cannot be answered at this time.

Considerable effort has gone into committee work for revision of the drainage basin reports for the Missouri River headwaters and the Yellowstone River basins. Arrangements have been made for the flood-control examinations of the Yellowstone and Missouri Rivers in Montana for which the Department of Agriculture is responsible with the Soil Conservation Service and the Bureau of Agricultural Economics. The preliminary flood control examination of the Spokane River was initiated in cooperation with these two and other agencies of the Department. Several other examinations are authorized under the Flood Control Act.

With the limited funds remaining available for flood control surveys prior to July 1, 1938, the Station expects to complete the preliminary report for the Spokane River watershed and devote as much additional time as possible to joint public hearings with the Army Engineers in consideration of flood control activities on other watersheds within the Region. Work on flood control surveys after July depends upon the allotting of additional funds.

March 1938

LOGGING AND MILLING INVESTIGATIONS OF CONVERSION COSTS AND VALUES

FIELD DIVISION: Forest Products

WORK PROJECT: Timber harvesting and conversion investigations

FUNCTIONAL PROJECT: Timber harvesting and conversion investigations

LINE PROJECT: Logging and Milling - cost values related to methods of cutting

PURPOSE OF WORK: To provide and disseminate by publication to lumbermen, foresters, and other interested agencies information on two important phases of logging and milling in the commercially important timber types of the Inland Empire. 1. Forest utilization data that will show for a community an individual operation, logging chance or sample plot, cutting limits (by tree d.b.h. and area), utilization standards, and operating methods necessary for the permanent welfare of the forest community concerned. 2. Logging studies showing efficiency of new logging equipment, new logging methods, and various methods of log transportation and their effect upon good forestry practice.

REVIEW OF PAST WORK: Economic cutting limits have been established for three commercially important timber types in the Region. In the white pine type of Idaho trees smaller than 14 inches in diameter are converted to lumber at a loss; likewise in the larch-Douglas fir forests of northwestern Montana trees 12 inches in diameter and smaller are converted to ties at a loss while in the ponderosa pine type trees under 19 inches in diameter are manufactured into lumber at a loss.

ACCOMPLISHMENTS DURING PAST YEAR: Studies of the utilization of Idaho white pine for matches indicated that approximately 100 million feet of 2- and 3-inch match plank are used annually. From 50 to 75 percent of the lumber cut from old growth white pine is suitable for match plank. Second-growth (65 years old) timber yields only 40 percent.

On the Bear Paw study 65-year-old white pine yielded 8,390 feet of logs per acre and 21,000 feet of merchantable sized logs were left in the residual stand. Lumber cut from these logs only yielded one-half of one percent of select or clear lumber compared to 12 percent for old-growth pine.

A study of power saw requirements for saws that will meet the needs of Inland Empire lumbermen indicated the following minimum requirements. (1) Weight 85 to 90 pounds, usable on sidehills

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up to 60 percent slope at minimum temperature 20° below zero. (2) Two-way cutting saw that can cut horizontally and vertically. (3) Motor 5 to 9 H.P. depending upon efficiency of power delivery and size of saw. (4) Motor lubricating and fuel systems must have positive action with motor tilted at 45 degree angle. (5) Extra rugged construction equipped with 24- and 36-inch saw capable of 4 hours' continuous use without filing. (6) Quick and positive acting clutch. (7) Selling price not more than $400.00.

Manuscript for a cooperatively published bulletin on the White Pine Lumber Company study was sent to the printer.

PLANS FOR 1938: 1. Complete Bear Paw study to determine yield of match blocks and splints from blocks.

2. Inaugurate study in cooperation with Division of Silvics designed to apply accumulated results of white pine selective logging studies to an individual logging chance or economic unit.

3. Apply accumulated results of ponderosa pine studies to a specific operating unit or community and determine optimum cutting and operating methods making greatest permanent contribution to community welfare.

4. Continue power saw investigations.

DATE OF COMPLETION: Continuous projects.

ASSIGNMENT: I. V. Anderson,
E. F. Rapraeger.

RP-NRM
Woods & Mill Utilization

March 1938

UTILIZATION PRACTICES IN THE SAWMILL AND IN THE WOODS

FIELD DIVISION: Forest Products

WORK PROJECT: Timber Harvesting and Conversion Practices

FUNCTIONAL PROJECT: Timber Harvesting and Conversion Practices

LINE PROJECT: Utilization practices in the sawmill and in the woods.

PURPOSE OF WORK: To obtain, and disseminate by publication, information on (1) overrun data and efficiency comparisons of logging and milling equipment; (2) wood wasted in logging and milling; and (3) volume and value losses caused by various manufacturing methods, fire, insects, etc.

REVIEW OF PAST WORK: Basic figures, showing the average overrun of lumber over log scale, are available for all Inland Empire species. In addition residual wood left after logging has been inventoried in the western white pine, ponderosa pine, larch-Douglas fir, and lodgepole pine timber types. Wood waste on some operations is appalling. It has been found that only 46 percent of the tree is used when larch trees are manufactured into ties by small mills. Each year the wood wasted in logging in the Inland Empire would pave the Northern Pacific Railway tracks between the rails with blocks of one cubic foot each from Seattle to Chicago.

ACCOMPLISHMENTS DURING PAST YEAR: Study of J. Neils Lumber Company operation at Libby, Montana furnished basic information for consideration of sustained yield unit in northwestern Montana. Data of primary value to Forest Service in appraising timber proposed for sale in the sustained yield unit.

PLANS FOR 1938: No work planned but carried on active list.

DATE OF COMPLETION: Continuous project.

ASSIGNMENT: I. V. Anderson,
E. F. Rapraeger.

RP-NRM
Properties & Uses

March 1938

PROPERTIES AND USES OF SECONDARY SPECIES

FIELD DIVISION: Forest Products

WORK PROJECT: Timber Harvesting and Conversion Investigations

FUNCTIONAL PROJECT: Timber Harvesting and Conversion Investigations

LINE PROJECT: Properties and uses of western larch, white fir, and lodgepole pine

PURPOSE OF WORK: To furnish owners and users of the secondary timber species of the Northern Rocky Mountain region with information in published form on the available supply, quality, and suitability for specific uses of these woods.

REVIEW OF PAST WORK: Departmental bulletins 285 and 408 have been published on western larch and white fir. Considerable data were assembled prior to 1933 for a bulletin on lodgepole pine when this work was side tracked for more urgent work in connection with the depletion and requirements phase of the Forest Survey.

ACCOMPLISHMENTS DURING PAST YEAR: No work done.

PLANS FOR 1938: Stimulation of the use of lodgepole pine in the Northern Rocky Mountain region for telephone and power poles and lumber and timber has revived the need for information on these species. Consequently, this project should be held on the active list but since no funds or personnel are available at present no work is planned for 1938.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: No personnel available.

RP-NRM
Forest Products Statistics

March 1938

PRODUCTION STATISTICS - LUMBER AND OTHER TIMBER PRODUCTS

FIELD DIVISION: Forest Products

WORK PROJECT: Forest Products Statistics

FUNCTIONAL PROJECT: **Forest Products Statistics**

LINE PROJECT: Statistics on the production of lumber and other timber products.

PURPOSE OF WORK: To obtain accurate data on the production of lumber and other timber products in the states of Montana, Idaho, and northeastern Washington in cooperation with the U. S. Bureau of the Census.

REVIEW OF PAST WORK: As a result of work done by this Station in the past, lumber production data from 1906 to the present time have been made available to the lumber industry and various government agencies that administer publicly-owned forest land.

ACCOMPLISHMENTS DURING PAST YEAR: Western white pine is the principal lumber species of the Inland Empire. In 1936 this region produced 548 million feet of white pine which was exceeded only once in the past and that was in 1926 when 551 million feet were produced. Thus, the depletion of our white pine timber proceeds at pre-depression rates even though the total Inland Empire lumber production for 1936 was only 75 percent of the pre-depression level.

PLANS FOR 1938: Continuation of project.

DATE OF COMPLETION: Continuous project.

ASSIGNMENT: C. N. Whitney,
M. E. Bouchard,
C. M. Rogers.

RP-NRM
Forest Products Statistics

March 1938

COST STATISTICS - FOR MANUFACTURE OF LOGS AND LUMBER

FIELD DIVISION: Forest Products

WORK PROJECT: Forest Products Statistics

FUNCTIONAL PROJECT: Forest Products Statistics

LINE PROJECT: Statistics on the cost of producing logs and lumber

PURPOSE OF WORK: To obtain accurate and detailed logging and manufacturing costs from the larger lumber companies in northern Idaho, eastern Washington, and western Montana by personal contact. Information is used in connection with lumber selling values for the appraisal for sale of Forest Service timber.

REVIEW OF PAST WORK: Detailed average lumber production costs are now available back to 1916. In 1936 costs were obtained from 27 operators representing sawmill operations in all commercial forest types of Montana, Idaho, and northeastern Washington.

ACCOMPLISHMENTS OF PAST YEAR: The 1937 costs when considered in connection with lumber selling values for that year show that Inland Empire white pine operators realized a margin of $5 per M feet for stumpage. This was the first year since 1929 that a satisfactory margin had been secured. From 1930 to 1933 negative stumpage margins amounting to as much as $8.50 per M feet (in 1932) occurred.

PLANS FOR 1938: Continue project.

DATE OF COMPLETION: Continued indefinitely.

ASSIGNMENT: P. Neff, Regional Logging Engineer,
I. V. Anderson.

SELLING VALUE STATISTICS - LUMBER AND OTHER TIMBER PRODUCTS

FIELD DIVISION: Forest Products

WORK PROJECT: Forest Products Statistics

FUNCTIONAL PROJECT: Forest Products Statistics

LINE PROJECT: Statistics on the selling value of lumber and other timber products

PURPOSE OF WORK: To collect and present in usable form lumber and timber products price statistics for northern Idaho, eastern Washington, and Montana in sufficient volume to indicate periodic trends in selling price of lumber (wholesale and retail), stumpage, logs, cedar products, and ties. These data are used in appraising the stumpage value of timber sold from Forest Service and Indian Service lands of the Inland Empire.

REVIEW OF PAST WORK: Publications are now available to practicing foresters, the lumber industry, and other interested agencies, showing (1) stumpage prices obtained by Inland Empire timber owners by species for each year since 1912, (2) average annual wholesale lumber selling price for each year since 1913 for the commercially important species of the Inland Empire, and (3) records on the selling price of sawlogs, cedar posts and poles, and ties are also available by years back to 1921.

ACCOMPLISHMENTS DURING PAST YEAR: Lumber prices rose sharply during the first half of 1937 but a slackened demand during the summer months was followed by a sharp decline the last three months of the year. This, however, did not offset general advances of 1937 prices over those of 1936. For instance, western white pine sold for $33.78 per M feet compared to $30.37 in 1936.

A publication showing lumber selling values of Inland Empire species since 1913 was prepared and released.

PLANS FOR 1938: Continue project.

DATE OF COMPLETION: Continued indefinitely.

ASSIGNMENT: E. F. Rapraeger on stumpage prices,
M. E. Bouchard to others.

RP-NRM
Wood Preservation

March 1938

DURABILITY OF WOOD - TREATED AND UNTREATED

FIELD DIVISION: Forest Products

WORK PROJECT: Wood Preservation Investigations

FUNCTIONAL PROJECT: Wood Preservation Investigations

LINE PROJECT: Service test records

PURPOSE OF WORK: (1) To determine the durability of treated and untreated telephone poles, fence posts, ties, and miscellaneous timbers produced from timber trees native to Montana, Idaho, and eastern Washington. (2) To ascertain the comparative value of various wood preservatives and treating processes. (3) To disseminate results of said work.

REVIEW OF PAST WORK: Periodic examinations of wood used in various forms have been made since 1910 on about 40 installations. At present the project has 20 installations including telephone and power poles, fence posts, mine timbers, and ties scattered widely throughout Montana.

ACCOMPLISHMENTS OF PAST YEAR: In 1910 a test track was installed cooperatively with the Northern Pacific Railway using local western hemlock ties. The 1937 examinations indicated that approximately 40 percent of these ties have given a service life of 23-1/2 years, which is ample support for the conclusion that hemlock will give a service life of between 25 and 30 years. Contracts for hemlock ties were awarded two large Inland Empire operators during 1937 on the basis of these tests.

PLANS FOR 1938: Make examinations of installations as follows: 4 telephone lines, 3 railroad tie test tracks, 4 fence and corral posts, and 1 mining timber installation. Memorandum reports will be written on these inspections and articles prepared for publication on (1) present status of service tests in Region One, (2) results to date of test on ties, and (3) results on tests of fence and corral posts. In addition, bring reports of examinations on all projects up to date.

DATE OF COMPLETION: Irregular intervals whenever no longer useful.

ASSIGNMENT: C. N. Whitney.

RE-NRM
Forest Survey
Inventory Phase

March 1938

INVENTORY PHASE OF FOREST SURVEY

FIELD DIVISION: Forest Survey

WORK PROJECT: Forest Survey

FUNCTIONAL PROJECT: Forest Survey

LINE PROJECT: Inventory phase of Forest Survey in the Northern Rocky Mountain region.

PURPOSE OF WORK: To make a comprehensive inventory of the existing forests of the regions.

REVIEW OF PAST WORK: Original field and office work on Inventory phase 44 percent complete for region as a whole, segregated by units as follows: northeastern Washington 100%; North Idaho 82%; western Montana 35%; and eastern Montana 2%. Basic statistical data published for all northeastern Washington counties and four of 10 North Idaho counties. Two-inch-to-the-mile township plat type maps and one-inch-to-the-mile unit (40 townships) type maps prepared for all acreage (23 million gross acres) covered to date. Many special requests for statistical data filled.

ACCOMPLISHMENTS DURING PAST YEAR: Completion of Inventory phase of Survey for region raised from 28 to 44 percent. Collected data on 149 M acres; adjusted the cruise for western Montana; mapped 3,607 M acres; compiled type and volume data on 4,156 M and 4,698 M acres, respectively; released seven county reports; and prepared maps for acreage covered in 1937. In addition prepared stand tables for two Idaho counties, determined converting factors for board foot and cubic foot volumes, did 70 mandays of compiling type and volume data for Spokane and Snake River drainages for flood control reports, and contributed 2 man-months of drafting work to other Station divisions. Supplied requests for 70 unit type maps, and a large number of requests for special data.

PLANS FOR 1938: Continue type and volume compilations for area covered to date. Prepare and publish basic statistical data for six remaining North Idaho counties, the northeastern Washington and North Idaho units, and four western Montana counties. Map and inventory three to four million acres in western Montana.

DATE OF COMPLETION: With a continued annual allotment equal in amount (regular and emergency) to that appropriated for F.Y. 1938 would expect to fully complete Inventory phase of work in entire region during F.Y. 1941.

ASSIGNMENT: M. Bradner, P. Kemp, P. N. Pratt to June 30, 1938, S. B. Hutchison, R. L. Conn, and M. E. Metcalf.

RE-NRM
Forest Survey
Growth Phase

March 1938

GROWTH PHASE OF THE FOREST SURVEY

FIELD DIVISION: Forest Survey

WORK PROJECT: Forest Survey

FUNCTIONAL PROJECT: Forest Survey

LINE PROJECT: Growth phase of the Forest Survey in the Northern Rocky Mountain region.

PURPOSE OF WORK: To determine the growth rates in old stands and on restocking areas and the probable future yield.

REVIEW OF PAST WORK: Normal yield tables available for ponderosa pine (R-6), white pine and lodgepole pine. Made larch-Douglas fir normal yield table. Made cubic-foot volume tables for western larch. Made application studies for all available normal yield tables for northeastern Washington and North Idaho types. Compiled area statistics of three northeastern Washington counties for application of growth rates.

ACCOMPLISHMENTS DURING PAST YEAR: (1) Completed ponderosa pine stocking correlation study in North Idaho. (2) Developed ponderosa pine normal yield table growth correction factor for predicting growth of understocked ponderosa pine stands of northeastern Washington and North Idaho. (3) Completed field work of Idaho white pine normal yield table growth correction factor. (4) Constructed form class taper curves of western red cedar poles. (5) Completed 50 percent of field work in cedar pole increment study.

PLANS FOR 1938: (1) Completion of cedar pole increment study. (2) Continuation of normal yield table application studies for forest types of western Montana. (3) Compilation of current annual growth estimates for northeastern Washington and North Idaho.

DATE OF COMPLETION: Assuming funds equal in amount to those provided last year are made available in the future, field work should be completed in F.Y. 1942.

ASSIGNMENT: L. J. Cummings,
M. Bradner.

RE-NRM
Forest Survey
Depletion Phase

March 1938

A STUDY OF FOREST DEPLETION FROM ALL CAUSES

FIELD DIVISION: Forest Survey

WORK PROJECT: Forest Survey

FUNCTIONAL PROJECT: Forest Survey

LINE PROJECT: A study of forest depletion from all causes in the Northern Rocky Mountain region.

PURPOSE OF WORK: To determine as part of the National Forest Survey the average annual forest depletion from cutting, fire, insect, and disease within the region.

REVIEW OF PAST WORK: Cutting depletion figures collected, compiled, and published for entire region. Field work on fire depletion partially completed for northeastern Washington, North Idaho, and western Montana. Insect loss survey covering North Idaho 50 percent complete. No work done on disease losses.

ACCOMPLISHMENTS DURING PAST YEAR: Recompiled portions of cutting depletion report to conform to census restrictions. Compiled lumber depletion statistics for 1935 and 1936 as supplement to cutting depletion report. Collected fire damage and loss data on 2 million acres in western Montana. No further progress made on insect and disease losses.

PLANS FOR 1938: To continue collection of fire damage and loss data in western Montana. Obtain blister rust losses in white pine. If sufficient funds available continue insect loss survey.

DATE OF COMPLETION: F.Y. 1940 if additional funds are allotted.

ASSIGNMENT: M. Bradner,
P. Kemp.

RE-NRM
Forest Survey
Requirements

March 1938

STUDY OF PRESENT AND FUTURE REGIONAL REQUIREMENTS FOR FOREST PRODUCTS

FIELD DIVISION: Forest Survey

WORK PROJECT: Forest Survey

FUNCTIONAL PROJECT: Forest Survey

LINE PROJECT: A study of present and future regional requirements for forest products

PURPOSE OF WORK: As a part of the National Forest Survey to determine the current needs for forest products based on present consumption and the trends in use of such products and the underlying causes for such trends.

REVIEW OF PAST WORK: Collected data on the amount of forest products used in urban and rural building construction and repair, in Federal and State road construction projects in Montana, in many public utility telephone and power lines, in lead, zinc, copper, and coal mines by tons of ore hoisted, and by county governments. Conversion factors showing relation between cubic volume and lumber footage computed but not checked or applied except to farm buildings. Final reports on fuelwood and fence post requirements completed.

ACCOMPLISHMENTS DURING PAST YEAR: Some checking of conversion factors and further analysis of farm building requirements.

PLANS FOR 1938: Collect additional data on forest products used by public and private enterprises. Recheck and apply to urban construction the conversion factors computed. Compute total lumber requirements for both urban and rural building construction in region.

DATE OF COMPLETION: F.Y. 1940 if funds sufficient to employ one technician on this phase of the survey are allotted.

ASSIGNMENT: M. Bradner,
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RE-NRM
Forest Survey
Economic Reports

March 1938

ECONOMIC ANALYSIS OF FOREST SURVEY DATA IN REPORT FORM

FIELD DIVISION: Forest Survey

WORK PROJECT: Forest Survey

FUNCTIONAL PROJECT: Forest Survey

LINE PROJECT: Economic analysis of forest survey data in report form.

PURPOSE OF WORK: To make an economic analysis of all Survey data and prepare final reports by economic units and regions.

REVIEW OF PAST WORK: No economic analysis can be made until data on all phases of Forest Survey are available for a unit. Units to be reported on tentatively set up.

ACCOMPLISHMENTS DURING PAST YEAR: Economic units to be reported on tentatively set up. Some work underway on type and volume compilations by units.

PLANS FOR 1938: Continue compilation of type and volume data for economic units. If growth, depletion, and requirements data can be made available for northeastern Washington and North Idaho units some analysis will be possible.

DATE OF COMPLETION: Indefinite under present financial situation.

ASSIGNMENT: M. Bradner,
Forest Survey staff.

RS-NRM
Pf-2
Behavior

March 1938

BEHAVIOR OF FIRES

FIELD DIVISION: Forest Management

WORK PROJECT: Fire Protection

FUNCTIONAL PROJECT: Pf-2, Behavior

LINE PROJECT: Daily and seasonal variables.

PURPOSE OF WORK: To determine the relation between meteorological elements and inflammability of the fuels of forest fires, including the factors of inflammability and how each may best be measured. Involves (1) what to measure; (2) how to measure; (3) where to measure; (4) when to measure; and (5) how to integrate these measurements into a practical scale of inflammability and fire danger.

REVIEW OF PAST WORK: Started in 1922. Factors to be measured, preliminary methods of measurements, and integrating "danger meter" first deemed satisfactory in 1931. Methods tested on 10 National Forests 1931 to 1933. Made official standard practice on 10 Forests in 1934. Extended to all 17 National Forests in Region One in 1936. Miscellaneous publication no. 29 published in October 1928. U.S.D.A. circular no. 398 published in July 1936. Two special phases, Altitude and Aspect and Vegetation studies segregated for more intensive work since 1934 and 1935, respectively. Duff hygrometer, wood cylinder, anemo-hygrograph, and fire danger meter originated by this research. Work materially curtailed in 1937 by reduction of qualified personnel.

ACCOMPLISHMENTS DURING PAST YEAR: New low-cost anemometer obtained from manufacturer, built to our specifications, resulting in a saving of $17,000 on 230 instruments purchased. Fire-danger meter method recommended by Washington Office for nationwide application. New and refined danger meter prepared for issue in 1938.

PLANS FOR 1938: Initiate test burns to check and learn more about what factors to measure, and continue "Vegetation" phase. Continue tests of all instruments to improve how to measure. From "Altitude and Aspect" phase determine better where and when to measure. Incorporate refinements in danger meter method of integration after field testing on large scale.

DATE OF COMPLETION: Unknown.

ASSIGNMENT: H. T. Gisborne,
G. L. Hayes on Altitude and Aspect phase.

RS-NRM
Pf-1
Attack

March 1938

PRESUPPRESSION, DETECTION, SUPPRESSION

FIELD DIVISION: Forest Management

WORK PROJECT: Fire Protection

FUNCTIONAL PROJECT: Pf-1, Fire control planning

LINE PROJECT: Fire control planning

PURPOSE OF WORK: To determine the principles, methods, and procedures that will furnish adequate manpower and facilities for fire control at least cost in accordance with local values at stake, occurrence of fires, and fuel types.

REVIEW OF PAST WORK: Started in 1931 and prosecuted actively through 1935, with great assistance from the Regional Office in funds and personnel. Planning methods evolved and applied on 10 National Forests comprising 17 million acres, and on National Park, and private forest lands. Progress report, "Fire Control Planning in the Northern Rocky Mountain Region" multilithed in 1936. Success of these methods in Region One resulted in nationwide application with local modifications.

ACCOMPLISHMENTS DURING PAST YEAR: Article "Hornby's Principles of Fire Control Planning" prepared for publication.

PLANS FOR 1938: Intensive checking of rates of spread and rates of held-line construction urgently needed to improve bases of fuel type classification. Will be done if funds are provided.

DATE OF COMPLETION: 1950, with increased funds.

ASSIGNMENT: H. T. Gisborne, for general supervision.

March 1938

NATURAL REGENERATION

FIELD DIVISION: Forest Management

WORK PROJECT: Silvicultural Investigations

FUNCTIONAL PROJECT: Western white pine type

LINE PROJECT: Natural regeneration

PURPOSE OF WORK: To investigate factors affecting natural regeneration and to develop methods of cutting that will result in adequate natural regeneration.

REVIEW OF PAST WORK: Natural regeneration has been a major project for the past 25 years; much of the Station's silvicultural work has been centered around studies of seed supply, seed germination, seedling establishment, and methods of cutting. These studies have been reported on in numerous publications and Station manuscripts from time to time. Although information is, of course, far from complete the scientific ground-work for successful natural regeneration has been laid.

ACCOMPLISHMENTS DURING PAST YEAR: 1. Outstanding accomplishment was the completion of a manuscript for "Natural Regeneration in the Western White Pine Type" to be published as a technical bulletin. This publication will sum up in comprehensive fashion information available to date on natural regeneration. A real need for this publication has long existed.

2. A preliminary quantitative study was made of light intensities penetrating various densities of timber stands. This study has furnished a means of relating stand density to light intensity. Before, there was no clear conception of what a 50 percent crown cover was, for instance, or how many and what kind of trees were needed to form it.

3. Partially completed overhaul of "going" projects to determine which should be continued and which discontinued. The yearly load of plot remeasurements, etc., was materially lightened by discontinuing observations on a number of plots and other installations that had served their usefulness. Some groundwork accomplishment in formulating a comprehensive future research program.

PLANS FOR 1938: 1. Complete a partially prepared manuscript "Natural Reproduction on Cut-over Areas in the Western White Pine Type." 2. Complete overhaul of going projects and formulation of future research plans. 3. An economic analysis of the application of methods of cutting. The purpose of this study is to appraise the economic aspects of various intensities of silvicultural practice. The study will give a valuable orientation and cross check on the adequacy and applicability of our silvicultural program.

DATE OF COMPLETION: 1. 1938 (see item 1 above). 2. Mostly in 1938. 3. 1939.

ASSIGNMENT: K. P. Davis and C. A. Wellner

RS-NRM
Mt-1

March 1938

STAND IMPROVEMENT

FIELD DIVISION: Forest Management

WORK PROJECT: Silvicultural Investigations

FUNCTIONAL PROJECT: Western white pine type

LINE PROJECT: Stand improvement

PURPOSE OF WORK: To develop cultural measures to improve the quality and growth of immature stands.

REVIEW OF PAST WORK: Studies of intermediate cuttings began in 1914 with the establishment of a series of thinning plots. Work was continued in a more or less desultory fashion until 1933 when, with the establishment of the Deception Creek Experimental Forest and availability of emergency funds, a moderate program of stand improvement was undertaken. Fairly extensive work was also done by the administrative organization. In 1936 available information on stand improvement practices was assembled in a mimeographed manual "Stand Improvement Practice in the Western White Pine Type". This manual is accepted by Administration as standard instructions for this class of work. The present status of the project is as follows: 42 permanent plots in young stands of less than pole size; several large scale cleaning projects under extensive observation; 39 thinning plots in pole-size stands (one of these is a 16-subplot latin square); and 2 small pruning plots.

ACCOMPLISHMENTS DURING PAST YEAR: Limited to extension work with the Administrative organization to check applicability of present methods and suggest improvements in technique.

PLANS FOR 1938: Install a series of pruning plots.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT: Kenneth P. Davis,
C. A. Wellner

RS-NRM
Mt-2

March 1938

STAND IMPROVEMENT

FIELD DIVISION: Forest Management

WORK PROJECT: Silvicultural Investigations

FUNCTIONAL PROJECT: Ponderosa pine type

LINE PROJECT: Stand improvement

PURPOSE OF WORK: To determine methods of thinning ponderosa pine.

REVIEW OF PAST WORK: Establishment of 18 permanent thinning plots.

ACCOMPLISHMENTS DURING PAST YEAR: None.

PLANS FOR 1938: No new work.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT: C. A. Wellner.

RS-NRM
ME-1

March 1938

GROWTH AND MORTALITY

FIELD DIVISION: Forest Management

WORK PROJECT: Mensuration Investigations

FUNCTIONAL PROJECT: Western white pine type

LINE PROJECT: Composition, growth, mortality and yield of forest stands.

PURPOSE OF WORK: To determine composition changes, mortality, and growth in both partially cut and uncut stands.

REVIEW OF PAST WORK: 1. Type-wide study of growth and yield in fully stocked natural stands. (Published as U.S.D.A. technical bull. 323.) 2. Establishment and periodic remeasurement of 34 permanent and 54 semi-permanent yield plots in natural stands. Continuing project. 3. Increment and mortality observations of the residual stand on 24 permanent plots in cut-over areas. 4. Type-wide study, begun in 1928 and field work completed in 1937, of growth and mortality in cut-over stands using temporary plot technique.

ACCOMPLISHMENTS DURING PAST YEAR: A full season of study by a four-man field crew of growth and mortality in cut-over stands. A total of 98 temporary sample plots established. Data partially analyzed.

PLANS FOR 1938: Prepare report for publication on growth in cut-over western white pine stands. No new field work scheduled.

DATE OF COMPLETION: Above manuscript to be completed not later than C. Y. 1939. Another short paper on a special stem analysis of increment also to be prepared.

ASSIGNMENT: Kenneth P. Davis,
Stewart E. Brown, Junior Forester (temporary) assigned to project.

RS-NRM
ME-3

March 1938

GROWTH AND MORTALITY

FIELD DIVISION: Forest Management

WORK PROJECT: Mensuration Investigations

FUNCTIONAL PROJECT: Larch-Douglas fir type

LINE PROJECT: Growth and mortality in cut-over stands

PURPOSE OF WORK: To determine growth and mortality in larch-Douglas fir stands for growth prediction purposes.

REVIEW OF PAST WORK: 1. Measurement of increment and mortality 25-35 years after cutting on 86 temporary plots in cut-over stands. Most of office compilations made and preliminary report prepared. Final report for publication yet to be written.

2. Five permanent yield plots in fully stocked natural stands.

3. Yield study made by Forest Survey taking data on 150 temporary plots. Of these plots, 42 have been selected for remeasurement as semi-permanent yield plots.

ACCOMPLISHMENTS DURING PAST YEAR: None.

PLANS FOR 1938: Prepare report for publication on cut-over area study.

DATE OF COMPLETION: C. Y. 1939 at the latest.

ASSIGNMENT: C. A. Wellner.

RS-NRM
ME-2

March 1938

GROWTH AND YIELD

FIELD DIVISION: Forest Management

WORK PROJECT: Mensuration Investigations

FUNCTIONAL PROJECT: Ponderosa pine type

LINE PROJECT: Growth and yield of fully stocked stands.

PURPOSE OF WORK: To determine growth and yield of fully stocked, even-aged ponderosa pine stands.

REVIEW OF PAST WORK: A total of 186 temporary yield plots established and data turned over to the Pacific Northwest Station as part of an interregional growth study. About 110 of these plots will probably be continued as semi-permanent plots and periodically remeasured. Six permanent yield plots on the Lolo National Forest remeasured periodically.

ACCOMPLISHMENTS DURING PAST YEAR: None.

PLANS FOR 1938: No new work.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT: C. A. Wellner.

RS-NRM
Fp

March 1938

PLANTING METHODS

FIELD DIVISION: Forest Management

WORK PROJECT: Regeneration Investigations

FUNCTIONAL PROJECT: Regeneration Investigations

LINE PROJECT: Planting methods

PURPOSE OF WORK: To determine the causes of low survival in Region One and evolve corrective measures. Initial attack on problem made by investigating for ponderosa and western white pine: (1) soil moisture and other soil factors; (2) care in planting and handling stock; (3) advanced growth of planting stock; (4) season of planting; (5) grade of stock; (6) root development by grades of stock; and (7) class of stock.

REVIEW OF PAST WORK: Refer to reports by Wahlenberg and others for early work done. Reforestation investigations were revived in the spring of 1936 when, in cooperation with the Region One Division of Planting, experiments investigating most of the seven items above listed were undertaken. Some significant results from the 1936 studies were: (1) First-year survival of ponderosa pine planting stock with poor roots is from a half to a fourth that of grade of stock. Grading at the nursery to eliminate poor stock before shipment to the field is needed. (2) Survival of stock that due to lack of cold storage facilities before shipment had begun leader growth was from 8 to 15 percent less than similar dormant stock planted at the same time. (3) Planting in the early spring gave 10 to 19 percent better first-year survival than late spring planting.

ACCOMPLISHMENTS DURING PAST YEAR: Due to insufficient personnel no field work was done by the Station during the past year. Grade of stock, carefulness-of-planting, etc., studies were continued by the Region One Division of Planting on practically the same basis as cooperatively set up in 1936. Work by Station was limited to further analysis of Region One plantation survival records.

PLANS FOR 1938: Prepare report on Region One plantation survival records. Additional work is dependent upon additional funds.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT: Kenneth P. Davis (acting), in cooperation with Region One, C. S. Schopmeyer, CCC Junior Forester, assigned to project.

RS-NRM
Fp

March 1938

BRUSHFIELD PLANTING

FIELD DIVISION: Forest Management

WORK PROJECT: Regeneration Investigations

FUNCTIONAL PROJECT: Regeneration Investigations

LINE PROJECT: Forest planting - brushfields

PURPOSE OF WORK: To develop effective and practicable methods of brushfield reforestation. In the western white pine type there are large areas, once very productive, that now support a heavy semi-permanent brush cover as a result of destructive logging and fires.

REVIEW OF PAST WORK: In 1935 broadcast brush burning and stripping with a bulldozer was tried out in a 90-acre tract on the St. Joe National Forest and a 6-acre tract on the Priest River Experimental Forest. Portions of these areas were broadcast burned, stripped and burned, and stripped and not burned. Planting with ponderosa and western white pine transplant stock was done in 1936 and 1937. No conclusive results as yet.

ACCOMPLISHMENTS DURING PAST YEAR: Examinations of St. Joe brushfield reforestation project made and an Applied Forestry Note (no. 83) prepared in the nature of a progress report giving results to date.

PLANS FOR 1938: No new work.

DATE OF COMPLETION: Project inactive for lack of funds and personnel.

ASSIGNMENT: No regular assignment.
C. S. Schopmeyer, CCC Junior Forester, acting.

RS-NRM
Fs

March 1938

DIRECT SEEDING

FIELD DIVISION: Forest Management Investigations

WORK PROJECT: Regeneration Investigations

FUNCTIONAL PROJECT: Regeneration Investigations

LINE PROJECT: Direct seeding

PURPOSE OF WORK: To develop successful methods of direct seeding.

REVIEW OF PAST WORK: Extensive attempts at direct seeding were made just after the big 1910 fires and were continued for several years by Wahlenberg. The results, with a few notable exceptions, were negative. Recognition of certain fundamental advantages of direct seeding, however, prompted a revival of direct seeding investigations in 1936 when a few seed spot and broadcast plots were established. No conclusive results have been obtained except further confirmation of the frequent observation that broadcast seeding without rodent protection is unsuccessful.

ACCOMPLISHMENTS DURING PAST YEAR: Examination of installations made in 1936 and establishment of four latin square plots to further test seed spot sowing under wire screens (fall sowing).

PLANS FOR 1938: Examination and analysis of 1937 plot installations. Installation of duplicate plots to test spring sowing with pre-treated seed. A limited testing of chemical rodent repellants will be undertaken principally to test substances developed elsewhere.

DATE OF COMPLETION: Continuing project. This project is financed out of CCC funds and with present allotments can be continued only on a very modest scale. Without CCC funds it would have to be dropped completely.

ASSIGNMENT: K. P. Davis (acting),
C. S. Schopmeyer, CCC Junior Forester.

RS-NRM
Fp

March 1938

ARBORETUM

FIELD DIVISION: Forest Management

WORK PROJECT: Regeneration Investigations

FUNCTIONAL PROJECT: Regeneration Investigations

LINE PROJECT: Arboretum

PURPOSE OF WORK: To test adaptability of exotic, and non-native species at the Priest River Experimental Forest.

REVIEW OF PAST WORK: Arboretum of 200 acres established in 1932. A total of 40 species in 1/4 to 1-acre blocks have been started but heavy losses due to severe droughts since planting have depleted some species. Fail-place planting has been done from year to year. For the time being it has been decided to push fail-place planting rather than adding new species.

ACCOMPLISHMENTS DURING PAST YEAR: Fail-place planting done on some blocks. Survival examinations made and working plan for project prepared.

PLANS FOR 1938: Cultivation of about 26,000 spots to remove heavy grass competition. Direct seeding and transplant planting of about 13,000 spots or seedlings on 23 blocks to fill in fail places. Thinning overwood on 10 blocks.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT: No regular assignment.
C. S. Schopmeyer, CCC Junior Forester, acting.

RS-NRM
B
Phenology

March 1938

PHENOLOGY

FIELD DIVISION: Forest Management

WORK PROJECT: Silvicultural Investigations

FUNCTIONAL PROJECT: Silvicultural Investigations

LINE PROJECT: Phenology

PURPOSE OF WORK: To observe annually seasonal vegetative events of principal trees and shrubs in Region One.

REVIEW OF PAST WORK: Project started in 1928 with phenological observations being made on 18 National Forests, at Savenac Nursery, Priest River Experimental Forest, Yellowstone, and Glacier National Parks. Observations made by rangers, etc. Observations dropped on 12 Forests between 1932 and 1934. At the beginning of 1937 observations were being made at only 9 stations. While a large mass of information has been collected, its usefulness is greatly limited by lack of uniformity and thoroughness in making observations. To the rangers it was chiefly just a "chore" and the Station found it impossible to give adequate technical supervision.

ACCOMPLISHMENTS DURING PAST YEAR: Project terminated in 1937.

PLANS FOR 1938: In either 1938 or 1939 plan to make a thorough compilation of the phenology data, preparing a report summarizing useful information.

DATE OF COMPLETION: Project terminated except for preparation of final report.

ASSIGNMENT: _____

RS-NRM
Fs

March 1938

GEOGRAPHIC RACES

FIELD DIVISION: Forest Management

WORK PROJECT: Forest Genetics Investigations

FUNCTIONAL PROJECT: Ponderosa pine

LINE PROJECT: Geographic races

PURPOSE OF WORK: To study development and adaptation of geographic races of ponderosa pine.

REVIEW OF PAST WORK: Progeny plots from 21 widely separated United States seed sources started in 1911. Plots examined and reported upon by Kempff in 1927. Thorough field examination and measurements made in fall of 1935 and analysis made by Weidman. Manuscript "Racial Influences in a 25-Year Test of Ponderosa Pine" submitted in September 1937 for publication in Journal of Agricultural Research.

ACCOMPLISHMENTS DURING PAST YEAR: Completion of manuscript cited above.

PLANS FOR 1938: None.

DATE OF COMPLETION: Continuing project.

ASSIGNMENT: C. A. Wellner.

March 1938

Management Short Grass Ranges

FIELD DIVISION: Range Investigations

WORK PROJECT: Range Management

FUNCTIONAL PROJECT: Range Management

LINE PROJECT: Management Short Grass Ranges

PURPOSE OF WORK: To determine best range management and utilization practices for both cattle and sheep; vegetation and economics of production both considered.

REVIEW OF PAST WORK: In progress since late 1932 on cattle and since 1936 on sheep range at Miles City. Based on quadrat chartings early in 1936, the density of vegetation at all three intensities of grazing was reduced to approximately one-third the 1933 level on cattle pastures. Unprecedented drought of 1934 and 1936 rather than intensity was responsible. Despite the uniform effects of drought at all three intensities, the penalties of heavy grazing showed up in the form of reduced calf weights and increased feed costs. Cows (20 each) on overgrazed, moderately grazed, and lightly grazed pastures produced in 1933-36, inclusive, 58, 68, and 62 weaning calves aggregating 14,431, 19,966, and 18,460 pounds, respectively. Total feed costs were 6.21, 3.87, and 4.31 cents, respectively, per pound of weaning calf weight. While drought was a major handicap, additional economic penalties were incurred by overstocking. Limited sheep range data are not yet significant.

ACCOMPLISHMENTS DURING PAST YEAR: Declines in density of old vegetation continued on all cattle pastures as a result of prolonged drought through half the 1937 season that also killed most seedlings. No calf crop data for 1937 because 2-year-old heifers that replaced original cows will produce first calves in 1938. Summer supplemental feeding was not required because of timely fall growth.

PLANS FOR 1938: Continue tests to determine response of vegetation, cattle, and sheep to weather and intensity of use. Stress technique to measure response of vegetation.

DATE OF COMPLETION: Not before 1947.

ASSIGNMENT: L. C. Hurtt,
L. Ellison, and
E. J. Woolfolk in cooperation with B.A.I. at the U.S. Range Livestock Experiment Station.

RR-NRM
Range Management
Research Methods-Range Ecology

March 1938

RESEARCH METHODS IN RANGE PLANT ECOLOGY

FIELD DIVISION: Range Investigations

WORK PROJECT: Range Management

FUNCTIONAL PROJECT: Range Management

LINE PROJECT: Research Methods in Range Plant Ecology

PURPOSE OF WORK: Evaluate existing and devise better methods and procedures for measuring response of range vegetation to habitat factors and various treatments.

REVIEW OF PAST WORK: Three methods for intensive density determinations, and sampling for pasture comparisons were tested in 1936. The point-analysis method proved less variable and cheaper than the pantograph-chart method, but further improvements are needed. Square decimeter frame method for direct estimates also gave less variation and lower costs and was used during 1937 to supplement rather than replace the pantograph method.

ACCOMPLISHMENTS DURING PAST YEAR: A new series of .3 meter paired plots were set up on cattle and sheep pastures as the most promising design for pasture comparisons and utilization studies. The decimeter frame method of estimating density was used. A series of plots were also clipped for production comparisons and if possible for measuring differences due to use.

PLANS FOR 1938: Complete compilation and analysis of 1937 data and set up additional major paired plots on sheep pastures. Results from last year and the coming season will be evaluated and tested against other methods and an effort made to develop less intensive but dependable method, also to establish paired plots away from division fences for more adequate pasture comparisons. Test use of calf weight data as a supplement to vegetation studies for making pasture comparisons.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: L. Ellison with assistance from E. J. Woolfolk and temporary men.

RR-NRM
Range Management
Range Utilization Standards

March 1938

RANGE UTILIZATION STANDARDS

FIELD DIVISION: Range Investigations (in cooperation with Region)

WORK PROJECT: Range Management

FUNCTIONAL PROJECT: Range Management

LINE PROJECT: Range utilization standards

PURPOSE OF WORK: To develop practicable standards for judging when ranges are properly utilized.

REVIEW OF PAST WORK: New; started late in summer as cooperative project with Regional Office with an allotment of A & P funds made in August 1937.

ACCOMPLISHMENTS DURING PAST YEAR: A series of paired plots were set up at Miles City in an effort to measure for Agropyron smithii production, residue, and utilization by weight. Protected and adjacent grazed plots were clipped at Vigilante to study utilization by comparisons of weight and height of Festuca idahoensis. Compilation of data nearly completed. Analysis started.

PLANS FOR 1938: To extent funds are available, continue work on Agropyron smithii and one other species on cattle pastures at Miles City. Design of experiment at Vigilante must be revised. Start study of resistance to grazing of one or two species there.

DATE OF COMPLETION: Two to three years for each species with adequate finances, if method proves to be practicable.

ASSIGNMENT: Part time of Ellison and Brierley to extent that other projects already financed will permit.

March 1938

MANAGEMENT SUMMER RANGES

FIELD DIVISION: Range Investigations

WORK PROJECT: Range Management

FUNCTIONAL PROJECT: Range Management

LINE PROJECT: Management Summer Ranges

PURPOSE OF WORK: To determine best management and utilization practices for summer cattle and sheep ranges; vegetation and economical production both considered.

REVIEW OF PAST WORK: Not yet financed on project basis. Past work at Vigilante confined largely to fence and improvement installation almost entirely from ERA and other emergency funds.

ACCOMPLISHMENTS DURING PAST YEAR: A test of cheatgrass range for horses was conducted on leased winter range near Perma in cooperation with the Regional Office. Horses were carried in satisfactory condition on pure cheatgrass from May to December at rate of 1.7 acres per horse month. This indicates higher palatability and grazing capacity for cheatgrass than is usually conceded to it.

A few protected plots were established and clipped in 1937 at Vigilante to study method for measuring proper utilization, also limited range reseeding tests made which contribute toward solution of summer range management problems. These activities are more fully set forth on separate status sheets.

PLANS FOR 1938: Confine to limited improvement work and to contribution possible to range utilization standards until funds are available for more comprehensive work on Season of Use, and other management projects.

DATE OF COMPLETION: Indefinite.

ASSIGNMENT: L. C. Hurtt,
T. E. Brierley, Junior Range Examiner.

March 1938

ARTIFICIAL RANGE RESEEDING

FIELD DIVISION: Range Investigations

WORK PROJECT: Artificial Reseeding Investigations

FUNCTIONAL PROJECT: Artificial Reseeding Investigations

LINE PROJECT: Artificial Range Reseeding

PURPOSE OF WORK: Test species, mixtures, and soils to determine limitations and comparative range value of most promising plants for revegetating depleted range lands under cheap methods.

REVIEW OF PAST WORK: Regular funds allotted July 1937 to supplement emergency funds used since fall of 1933 mainly on field demonstration rather than detailed research basis on about 325, 147, and 1,215 acres on 10 National Forests, on Experiment Station lands and on lands of 43 rancher cooperators, respectively, in 25 Montana counties. Rough guides as to the best species (crested wheatgrass), minimum soil preparation, depth (3/4 to 1 inch), date (fall), and rate (3 to 5 pounds), have been developed but need refinement by more intensive controlled research.

ACCOMPLISHMENTS DURING PAST YEAR: Partial survey made on five National Forests to locate areas needing reseeding. Older plantations showed generally higher degree of success of crested wheatgrass than at previous examinations and confirmed the promise of cheap methods and little soil preparation. Demonstration plots were established on depleted but unplowed soil types at Vigilante and elsewhere. Soils field kit tried in preliminary study of soils relations that affect reseeding. Surface soil temperatures up to 134° maximum on unshaded soil as compared to 117° under partial shade helps to explain better survival under even drought stunted thistles. Replicated plots at Miles City confirmed previous conclusions as to best species, depth of seeding.

PLANS FOR 1938: Prepare tentative regional reseeding guide. Revise working plan for more comprehensive detailed research under replicated control in which mixtures, soil relations and deficiencies, etc., also inexpensive methods with special reference to depleted but unplowed, rough, wild lands will be stressed.

DATE OF COMPLETION: Cheap methods phase in 1942. Indefinite for other phases.

ASSIGNMENT: L. C. Hurtt,
L. R. Short,
W. L. Norem.

R-NRM
Cooperation
Western Range Survey
Region E

March 1938

COOPERATIVE WESTERN RANGE SURVEY, REGION E

FIELD DIVISION: Western Range Survey

WORK PROJECT: Western Range Survey

FUNCTIONAL PROJECT: Western Range Survey

LINE PROJECT: Western Range Survey of Region E

PURPOSE OF WORK: The Cooperative Western Range Survey of Region E was organized in April 1937 by a memorandum of understanding between the following cooperating agencies: Agricultural Adjustment Administration, Forest Service, Soil Conservation Service, and Resettlement Administration of the United States Department of Agriculture; Idaho Agricultural Experiment Station, Montana Agricultural Experiment Station, Washington Agricultural Experiment Station; and the Division of Grazing and Bureau of Indian Affairs of the United States Department of the Interior. These cooperating agencies organized to accomplish the following objectives:

1. (a) To assemble a comprehensive inventory of all range resources of Region E which includes all of Montana, ten counties in northern Idaho, and four counties in northeastern Washington. This objective includes the joint analysis and interpretation of all usable data now available and that are to become available during 1937 on the present condition and potential use of range lands within the region and to present the results on maps and by tabulations by counties to serve as a basis for developing future programs of the cooperating agencies;

(b) To coordinate and round out, insofar as practicable, the range survey work of all cooperating agencies to assure uniformity in methods, procedure, analyses, and results, so that both data available from previous surveys and those to become available can be fitted into the general survey that will ultimately cover the entire range area.

2. To determine the location, extent, type, and composition of plant cover and grazing capacity, under uniform methods and procedure, for range lands within the region and jointly to interpret and present this information in a form that will lend itself most readily to the determination of essential management and betterment practices in the development and administration of conservation programs.

REVIEW OF PAST WORK: This is a new project started in 1937.

-over-

ACCOMPLISHMENTS DURING PAST YEAR: Compiled the data on 1,376,000 acres of AAA and Farm Security Administration (Resettlement Administration) range surveys. Drafted a 2-inch scale grazing survey type map (Form WRS-4) and a range improvement practice overlay map on 830,000 acres. Drafted 1/2-inch scale base maps of three counties and 1-inch scale base maps of five counties in Montana. Held three Interagency Committee meetings to develop a set of Interagency Palatabilities for the eastern part of the region to be used by all cooperating agencies and also to analyze, coordinate and interpret range survey data and develop additional tabulation and map forms mutually acceptable to all cooperating agencies. Made field inspection to assist in securing coordination and uniformity of work between survey projects of cooperating agencies.

PLANS FOR 1938: The current program provides for the mapping of 4,705,000 acres and tabulating of 6,395,000 acres and the preparation of written WRS reports on seven eastern Montana counties by July 1. Present WRS allotments will be expended between May 1 and July 1. The project is dependent upon the contribution of personnel and funds from cooperating agencies. Continuation of the work beyond July 1 is dependent upon additional allotments.

DATE OF COMPLETION: Uncertain; see above.

ASSIGNMENT: Arthur Cramer, G. C. Whitlock, Edna Morrison, and four to eight temporary WRS field assistants; also, two to seven draftsmen and compilers are assigned to work with the WRS project in Missoula by the Farm Security Administration with all salaries and expenses paid for by that agency.

March 1938

RI-NRM
Influences
Flood Control Surveys

FLOOD CONTROL SURVEYS

FIELD DIVISION: Influences

WORK PROJECT: Flood Control Surveys

FUNCTIONAL PROJECT: Flood Control Surveys

LINE PROJECT: Flood Control Surveys

PURPOSE OF WORK: To make investigations for run-off and waterflow retardation and soil erosion prevention on watersheds as specified by the flood control act of 1936, as amended.

REVIEW OF PAST WORK: New project 1937.

ACCOMPLISHMENTS DURING PAST YEAR: Conferences with representatives of Bureau of Agricultural Economics and Soil Conservation Service to discuss outline for preliminary flood control report on Spokane River drainage. Assignment of parts of outline. Preparation of Forest Service share of preliminary flood control report started. Attendance joint public flood control hearings held in cooperation with U. S. Army Engineers on Spokane and Yellowstone River watersheds. Assignment of responsibilities for preparation of preliminary examination report on Missouri River headwaters. Chairman of Departmental sub-committee for revision of Missouri River and Yellowstone River drainage basin reports for the Water Resources Committee.

PLANS FOR 1938: Complete Spokane River watershed preliminary flood control report in cooperation with representatives of B.A.E. and S.C.S. Attend joint public flood control hearings on other river watersheds within the region. Work after July depends upon action of Congress.

DATE OF COMPLETION: See above.

ASSIGNMENT: S. N. Wyckoff,
V. H. Hougen in cooperation with representatives of Bureau of Agricultural Economics, Soil Conservation Service, and other cooperating agencies of the Department.

APPENDIX

(a) Personnel

(b) Publications

(c) Financial Budget

(d) Increases Needed for New Work

LIST OF PERSONNEL AS OF DECEMBER 31, 1937

Overhead Administration

Stephen N. Wyckoff,	Director
Melvin I. Bradner,	1/6 of year
Mary J. Pershing	
Norman H. Larsen	
Dagmar Duncan	
Marie Bouchard,	2/3 of year
* Claire Bolander	

Division of Silvics, Kenneth P. Davis, in charge

Silvicultural Investigations

Kenneth P. Davis,	2/3 of year
Charles A. Wellner,	11/12 of year
** Max Howell	
* Elton E. Bentley	

Mensuration Investigations

Kenneth P. Davis,	1/6 of year
* Stewart E. Brown	
** John D. Crowe	

Regeneration Investigations

Kenneth P. Davis,	1/6 of year
* Clifford E. Schopmeyer	

Forest Genetics Investigations

Charles A. Wellner,	1/12 of year

Division of Forest Protection, Harry T. Gisborne, in charge

Behavior of Fire

Harry T. Gisborne,	3/4 of year
C. Lloyd Hayes	
* Theodore Kachin	
* Jasper Buck	
** Vern L. Cline	
** Bert L. Haiman	

Fire Control Planning

Harry T. Gisborne,	1/4 of year

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* Temporary, with or without appointment
** Junior assistant to technicians (CCC).

Division of Range Investigations, Leon C. Hurtt, in charge

Range Management Investigations

Leon C. Hurtt,	3/4 of year
Lincoln Ellison	3/4 of year
E. Joseph Woolfolk	3/4 of year
* Tom E. Brierley	1/2 of year
* George H. Cable	
* Clark E. Holscher	
** Anthony B. Evanko	
* Henrietta A. Piscot	

Artificial Reseeding Investigations

Leon C. Hurtt,	1/4 of year
Laurence A. Short	
* W. Luther Noreen	

Division of Forest Survey, Melvin I. Bradner, in charge

Inventory Phase

Melvin I. Bradner,	5/6 of year
Paul D. Kemp	11/12 of year
Percy E. Pratt	
S. Blair Hutchison,	11/12 of year
* Jess M. Honeywell	
* William L. Royer	
* Eric C. Rutquist	
* Henry J. Piscot	
** Robert L. Conn	
** Melvin E. Metcalf	
* Bill M. MacLean	
* Granger W. Brenning	
* Frances Hughes	

Growth Phase

Laurence J. Cummings
* Richard M. Varney

Present and Future Requirements

Chester N. Whitney,	1/2 of year
S. Blair Hutchison,	1/12 of year

Depletion Phase

Paul D. Kemp,	1/12 of year

I. Division of Forest Products, Irvin V. Anderson, in charge

A. Timber Harvesting and Conversion Investigations

Irvin V. Anderson, 3/4 of year
Elmer F. Rapraeger, 3/4 of year
** Charles A. Rogers, 1/2 of year
** Ronald L. Sanderson

B. Wood Preservation Investigations

Chester N. Whitney, 1/4 of year

Forest Products Statistics

Irvin V. Anderson, 1/4 of year
Elmer F. Rapraeger 1/4 of year
Chester N. Whitney, 1/4 of year
Marie E. Bouchard, 1/3 of year
** Charles A. Rogers, 1/2 of year

Range Utilization Study

Chandler Jensen
* Adolph Hecht

Flood Control Surveys

* Volorus H. Hougen

C. Multilithed and Mimeographed Progress Reports

Western Range Survey

* Arthur Cramer, in charge
* George G. Whitlock
* John LaCasse
* Carl Wetterstrom
* Arnold W. Bolle
* Jack M. Buckhouse
* Louis Demorest
* Harold Dopfer
* Walter Mace
* Earl Sparks
* Karl J. Wilkinson
* Robert A. Williams
* Russell Zill
* Edna Morrison

PUBLICATIONS IN PRINT

I. PUBLISHED DURING 1937

A. Departmental Bulletins

None

B. Outside Publications

Fire

1. The technique of duff hygrometer calibration. By T. Kachin and H. T. Gisborne. Journal of Forestry, vol. 35, no. 8, August 1937.

Range

2. Effects of drought on vegetation near Miles City, Montana. By Lincoln Ellison and E. J. Woolfolk. Ecology, vol. 18, no. 3, July 1937.

Products

3. The use of Idaho white pine for matches. By E. F. Rapraeger. The Timberman, vol. 38, nos. 10 and 11, August and September 1937.

Survey

4. A cubic-foot volume alignment chart for western larch. By L. J. Cummings. Journal of Forestry, vol. 35, no. 4, April 1937.

Range

5. Grazing too early undermines range welfare. By L. C. Hurtt. The Montana Farmer, March 1937.

General

6. Education for forest research. By S. N. Wyckoff. The Idaho Forester, vol. XIX, 1937.

C. Multilithed and Mimeographed Progress Reports

Fire

1. Variations of some fire danger factors with altitude, aspect, and time of day. By G. L. Hayes. Applied Forestry Note no. 80, April 1937. Mimeographed.

Silv

2. Growth after logging of larch-Douglas fir stands in northwestn Montana. Division of Silvics. Applied Forestry Note no. 79, April 1937. Mimeographed.

Silv

3. Survival increased by carefulness in field planting. By W. H. Cushman and R. H. Weidman. Applied Forestry Note no. 81. May 1937. Mimeographed.

Prod

4. Production of lumber, lath, and shingles in Idaho and Montana, 1936. By C. N. Whitney. Applied Forestry Note no. 81. August 1937. Mimeographed.

PUBLICATIONS PLANNED

I. Formal Manuscripts to be Submitted for Departmental Publication Prior to June 30, 1938

1. Drought, a decisive but underrated factor in range management practices. By Leon C. Hurtt. Approximately 40-50 pages; summary of four years' data from the Miles City Experimental Range.

II. Formal Manuscripts to be Submitted for Departmental Publication During F.Y. 1939

1. Natural regeneration in the western white pine type. By I. T. Haig, K. P. Davis, and R. H. Weidman. Approximately 280 pages.

2. Growth on cut-over areas in the western white pine type. By K. P. Davis, C. A. Wellner, and S. E. Brown. Approximately 125 pages.

3. Growth on larch-Douglas fir cut-over areas in western Montana. By C. A. Wellner and C. L. Jones. U.S.D.A. circular, or Journal of Agricultural Research. Approximately 125 pages.

FORM FOR PROJECT BUDGET

1. Direct and indirect costs by Divisions.

Division	Indirect project costs (overhead)	Direct project costs	Total costs
Silvics	2,594	12,131	14,725
Forest Protection	2,400	11,225	13,625
Range	4,900	28,300	33,200
Products	-	12,100	12,100
Survey	5,200	24,300	29,500
Range Utilization	-	4,000	4,000
Flood Control Surveys	-	3,000	3,000
Western Range Survey	-	17,450	17,450
Total	15,094	112,506	127,600

Appendix

(d) Increases Needed for New Work

Increases needed for new items and for work now underway have been submitted in separate S-WPA Finance Appropriations letters of May 29, 1937 and April 22, 1938. The tabulation attached shows the appropriation estimates recommended for F.Y. 1940.

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FORM FOR PROJECT BUDGET

2. Distribution of direct costs by main projects.

Division and work project	Cars, maintenance, and new	Scientific equipment, etc.	Travel expenses; other than cars	Salaries: Regular	Salaries: Temporary	Total
lvics						
Silviculture	522	462	1,000	4,439	600	7,023
Mensuration	162	111	310	1,000	600	2,183
Regeneration	216	95	414	2,000	200	2,925
Total	900	668	1,724	7,439	1,400	12,131
orest Protection	200	964	1,000	8,761	300	11,225
ange						
Grazing Man.	700	4,620	1,593	10,386	3,500	20,799
Artificial reseeding	700	585	800	4,600	816	7,501
Total	1,400	5,205	2,393	14,986	4,316	28,300
Forest Products						
Logging & Milling	700	621	550	6,229	-	8,100
Statistics	-	500	-	3,000	-	3,500
Preservation	-	-	50	450	-	500
Total	700	1,121	600	9,679	-	12,100
	1,200	600	4,000	18,500	-	24,300
Forest Survey	-	500	500	-	3,000	4,000
Range Utilization	-	100	600	-	2,300	3,000
Flood Control Survey	300	1,850	1,100	-	14,200	17,450
Western Range Survey						

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ESTIMATES FISCAL YEARS 1939 AND 1940

Northern Rocky Mountain Forest and Range Experiment Station — April, 1938

Functional Classification	F.Y. 1939	F.Y. 1940	Increase	Number of supporting statement	Priority 1/ I	Priority 2/ P
Forest Management Investigations						
Fire Protection Investigations	12,625	22,625	+ 10,000	1	2	2
3/ Fire Control Planning Pf-1	1,000	15,000	+ 14,000	1	1	1
3/ Fire Behavior Pf-2						
Silvicultural Investigations	14,725	19,725	+ 5,000	2	2	2
Management White Pine						
Forest Regeneration Investigations	-	12,000	+ 12,000	3	1	1
Forestation						
Range Investigations						
Seasonal Use Investigations	-	15,000	+ 15,000	4	1	2
3/ Seasonal Use on Mt. Summer Ranges						
Artificial Range Reseeding Investigations	8,800	23,800	+ 15,000	5	1	2
3/ Artificial Range Reseeding						
Survey of Forest Resources, Present and Future Requirements						
3/ Forest Survey	30,000	110,000	+ 80,000	6	2	1
Forest Products Investigations						
Production Costs & Utilization Investigations	5,100	13,100	+ 8,000	7	1	2
3/ Logging & Milling Studies						
Properties & Uses of Western Larch	-	8,000	+ 8,000	13	2	1
Forest Economics Investigations						
Financial Aspect of Private Forestry in the White Pine Forests of Idaho	-	15,000	+ 15,000	8	1	1
Forest & Range Influences						
Erosion-Streamflow Investigations	-	15,000	+ 15,000	9	1	2
White Pine Associations	-	15,000	+ 15,000	10	1	2
Plains and Foothills	-	-	-	11	2	1
Improvement Construction 3/	-	6,042	+ 6,042	12	2	1
Improvement Maintenance						

1/ Priority based on intrinsic merits.
2/ Priority based on practical interest.
3/ New recommendation and justification statements have been prepared for these items. For items not so marked see statements prepared for F.Y. 1939 and now in Washington (letter May 21, 1937).